

Characteristic economical quantities for successful biomass heating plants

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In the years 1998 and 1999 C.A.R.M.E.N. e.V. investigated detailed and evaluated 6 biomass heating plants in Bavaria. The aim of this evaluation was, to achieve an extensive data collection on the basis of some well chosen facilities and to derive manifold knowledge and characteristic quantities which are important for the planning and realisation of further projects. Therefore among other things the actual situation of the heating plants was registered, a comparison was made to the respective project planning and conclusions for future projects were derived.

Results of the evaluation of biomass heating plants

Investigated data of the examined plants: The economical year 1996/97 was chosen as a research period for the evaluation of the 6 biomass heating plants. The data collection was made locally by the use of a questionnaire. The total thermal output of the investigated heating plants reached from 1.4 MW to 4.3 MW with an average output of 2.4 MW. Basically it could be noticed that with most biomass heating plants a reliable heating with a very low level of pollution in comparison to heating with fossil fuels could be realized. The investigated biomass heating plants in Bavaria show bivalent heating structure. The base load of heat production is covered by one biomass boiler. For covering peak load, oil or natural gas boilers are for disposal.

Prices for wood chips from forest residues were mainly around 16 Euro/MWh. For wood chips from industrial residues, prices of 9 Euro/MWh were paid. Even cheaper were wood chips from landscape care with prices below 7 Euro/MWh. The fuel prices for biomass were 11 Euro/MWh in the average.

Results of the evaluation: In surprisingly many cases a clear oversizing of the heating equipment could be noticed, which not seldom led to technical and economical problems. In one case the capacity of the boilers was about 200 % higher than the peak heat demand of the users.

A very high cost saving potential could be noticed at the erected buildings. It became obvious that in the past in many biomass heating plants the amount of investment for the building was in no sensible relation to the economical results of the heating plant. Considering the given economical conditions, it will be necessary to set cost limits for the buildings in the future.

Basically only such projects should be realized which allow an economical bearable running of the biomass heating plant at justifiable prices for the heat. In order to avoid economical losses, it seems important for future projects to consider more strongly the least possible specific yearly costs as well as securing the necessary basis of an economically successful running. To reduce the specific yearly total costs, mainly the specific capitalbound costs have to be kept low, which at the investigated projects have caused about 70 % of the specific yearly total costs.

As size of district heating net and therefore the costs of the heating distribution are usually given, reduction of capitalbound costs have to be concentrated on the heating equipment and the buildings. Investments have to be restricted to the really essential things. Only such projects should be realized that show the characteristic quantities listed below.

Characteristic Quantities

structure of heat demand

specific heat demand (distribution)	> 1.5 MWh/m
specific power demand (distribution)	> 1 kW/m
losses in the heating net	< 400 kWh/m

heat production

working hours biomass boiler	> 2500 h
heat production on bases of biomass	>= 80 %

investment

district heating net	< 300 Euro/m
volume of buildings	< 300 Euro/m ³
fuel bunker (biomass)	< 225 Euro/m ³
fuel storage (biomass)	<= 125 Euro/m ³
specific total costs (power)	< 500 Euro/kW
specific total costs (heat demand)	< 375 Euro/MWh
storage capacity	<= 10 %

economical quantities

capitalbound costs	<= 25 Euro/MWh
consumptionbound costs	<= 25 Euro/MWh
other costs	<= 6 Euro/MWh
total specific costs of heat production	<= 50 Euro/MWh
auxiliary electric energy (regarding total heat production)	<= 2 %
requirement of personal	<= 700 h/a

The Project "Evaluation of existing pilot and demonstration plants for the regenerative production of energy on the bases of biomass in the Federal Republic of Germany" from which the basic datas have been taken has been established by C.A.R.M.E.N. e.V. with the aid of the Technical University of Munich and by means of the German Foundation for the Enviroment (DBU). A short form of the final report in German can be downloaded under: <http://www.carmen-ev.de/>.